Application No.: 10/674,022
Amendment dated: May 4, 2006
Reply to Office Action mailed: 02/07/06

Remarks/Arguments

The rejection of Applicants' claims 1-11 and 13-22 under 35 U.S.C. 102(b) in view of Bauer is respectfully traversed and reconsideration is respectfully requested.

The Examiner has concluded that in Figure 5 of Bauer, an LNG plant is shown which uses a plurality of turbines which are powered by natural gas and compressed air to compress refrigerant used for refrigeration with the exhaust heat from the turbines being used to generate steam which is expanded to produce electricity. A fair reading of Bauer discloses that Figure 5 shows a system wherein the liquefaction cycle (LC) and the pre-cooling cycle (PC) compressors are driven by fueled turbines and the sub-cooling cycle compressors are driven by a steam turbine. This steam turbine is driven by steam from a waste heat recovery system. This waste heat recovery system is described as recovering the waste heat from Frame 7 compressors which are stated to be approximately 33 percent efficient. It is not clear what the efficiency of these compressors may be since in Figure 5 the PC and LC turbines are shown to operate at 36 percent efficiency. This leaves a requirement for 28 percent of the overall shaft power for the sub-cooling compressor. It appears that more than 28 percent will be required if the gas-fired turbines are 33 percent efficient as disclosed. In any event, it is hypothesized by Bauer that an electric generator will recover the surplus of the energy. In Figure 5 the possibility that the excess energy might be available and recovered as electricity in an electric generator is proposed. This is not a disclosure of the method or the apparatus claimed by the Applicants. Applicants supply the needed compression power by hydrocarbon gas-fired turbines and then recover electricity from steam produced from the resulting exhaust gas to produce electricity. The steam is used to produce electricity rather than to drive a further compressor. In other words, the hydrocarbon fueled turbines are used to supply the required energy for compression, thus no generator load is placed on the turbines. All of the exhaust gas is used to produce electricity by using the hot exhaust gas from the turbines to produce

steam at an elevated temperature and pressure by heat exchange with the exhaust gas stream. The steam is used to drive a steam turbine to drive an electrical power generator to produce electrical power for use in the light hydrocarbon gas liquefaction process.

Unlike Bauer, Applicant's electrical generator receives the steam to generate electricity for use in the process and is not limited to hypothetical excess steam power after powering a steam turbine (not used to compress refrigerant by Applicants). Applicants consider the claimed process to produce electricity from the exhaust gas with reduced carbon dioxide emissions by comparison to a separately fired electric generation facility used for this purpose. Further it is considered that more heat value can be recovered from the exhaust gas when steam at a lower temperature and pressure is required. Higher pressure and temperature steam is required to drive a seam turbine connected to a compressor to drive a turbine connected to an electric generator.

The Bauer disclosure is at most an obvious proposal since the efficiencies given do not support the premise that there will be any excess steam.

Further in Figures 6 and 7 Bauer discloses other processes, both of which require the use of cogeneration plants or combined cycle power plants, both of which are independently fueled by fuel gas. This again, is not the invention claimed by Applicants. It is therefore respectfully submitted that clearly Bauer does not disclose Applicants' claimed invention and it is respectfully requested that all rejections under 35 U.S.C. 102(b) in view of Bauer be withdrawn.

The rejection of claims, 1, 2 6-11, 13, 14, 18-22 under 35 U.S.C. 103(a) as unpatentable over U.S. Patent 5,025,631 issued June 25, 1991 to Paul W. Garbo (Garbo), in view of U.S. Patent 4,566,885 issued January 28, 1986 to Frederick W. Haak (Haak) is respectfully traversed and reconsideration is respectfully requested.

Garbo discloses a process whereby the incoming gas stream 10 is used to drive a compressor used to compress a refrigerant. A gas turbine is not taught or suggested in the

Garbo process to drive a compressor to compress a refrigerant. Turbine 13 is a turboexpander driven by a compressed gas stream. Compressor 74 is driven by an electric motor 75. Turbine 26 is also a turboexpander used to reduce the pressure of the exhaust gas stream and drive an electric generator. No combusted gas is used to drive turbine 13 used to drive the compressor for the refrigerant. Since this is a required element in Applicants' claimed invention, it is considered clear that Garbo relates to a different type of process. Garbo avoids the use of gas-fired turbines by using a gas-fired vessel 20 wherein combustion is achieved through a burner 19 disclosed to reduce the production of nitrous oxides. This vessel produces an exhaust stream which is passed to a heater 11 and thereafter via a line 44 to an amine scrubber. Stream 44 is not used to produce steam at an elevated temperature and pressure for use to drive a compressor. Steam is produced by a heating means inside the reaction vessel when the natural gas is combusted to produce a hot stream of steam used to drive a turbine and to supply heat to a vessel via a line 63. Electricity is produced by a generator 32 coupled to turbine 26. The exhausted steam from turbine 26 is passed through a cooler and then pumped via a pump 30 to recycle to the gas combustion vessel 19. This process basically combusts natural gas in a vessel which does not produce an exhaust stream which is used to produce steam. The steam used to drive turboexpander 26 is produced in a heat exchanger inside gas combustion vessel 19. By contrast, Applicants use a gas-fired turbine exhaust to produce steam from the exhaust stream to drive an electrical generator to produce power for use in the process. By contrast Garbo produces a carbon dioxide stream, which after suitable treatment, is compressed, refrigerated and passed to recovery as a product using the refrigerant stream compressed in a turbine 33 driven by turbine 13 which is driven by the incoming natural gas.

It is clear that Garbo does not relate to a similar type process. There is no suggestion whatsoever that an exhaust gas stream from the combustion zone should be used to produce steam to drive a generator. The Garbo generator is driven by a steam stream which recycles inside a loop which removes heat from the reaction vessel. The

exhaust gas stream from gas combustion is used by Garbo to heat the incoming gas stream and then passed to an amine treatment to produce carbon dioxide. This is a radically different system than used by Applicants.

Particularly, note Garbo, column 1, lines 33-40 where Garbo states that "... a principal object of this invention is to avoid the use of gas turbines .... by substituting therefor steam turbines." A related objective is "... is to generate steam for the steam turbines by introducing fuel gas admixed with air into a porous fiber burner..." Garbo clearly teaches away from Applicants' claimed invention. It requires considerable imagination to consider this reference to show or suggest anything related to Applicants' claimed invention.

Haak is directed to a system whereby electric motors/generators are shaft-coupled to gas turbines used to drive compressors so that when the gas turbine is operating at peak efficiency the generator may be used to generate electrical power for use in other parts of the process; for instance, with gas turbines operating at less than peak efficiency. The use of the electrical

generator/motors is to even the load in the system by varying the power passed to each gas-fired turbine by the shaft coupled electrical motor/generator. While the use of starter motors is well known, this reference is not directed to starter motors but to generator/motors which can be used

to either pass additional electric power to a gas-fired turbine powered compressor or receive/or transmit electric power from selected ones of the gas-fired turbine compressors if the selected turbine compressor is running at a power output level above or below that required. This reference in no way shows or suggests Applicants' claimed invention since all the electrical components are shaft-coupled, none are driven by steam and none are used to recover energy from the exhaust gas stream from the gas-fired turbines.

Combination of this reference with Garbo immediately places gas-fired turbines back into a reference which has as its stated primary objective the avoidance of the use of

gas-fired turbines. Further a difficulty emerges when attempting to establish that the exhaust gas stream from the gas-fired turbine should be used to produce steam where Garbo discloses that this stream is used to heat the incoming gas stream and then is partially recovered as a product (CO_2). These references are simply not combinable and in no way show or suggest Applicants' claimed invention even if combined.

The rejection of Applicants' 3-5 and 15-17 under 35 U.S.C. 103(a) as unpatentable over Garbo, in view of Haak above and further in view of any one of U.S. Patent 5,457,951 issued October 17, 1995 to Paul C. Johnson , et al (Johnson, et al); U. S. Patent 5,295,350 issued March 22, 1994 to Edward T. Child, et al (Child, et al); or, U.S. Patent 4,907,405 issued March 13, 1990 to Robert J. Polizzotto (Polizzotto) is respectfully traversed and reconsideration is respectfully requested.

The Examiner's conclusion that Applicants' basic inventive concept has been shown by Garbo in view of Haak is respectfully traversed in view of the comments above. None of these references have shown or suggested Applicants' claimed invention. Apparently Johnson, et al, Child, et al, and Polizzotto are all considered to show that the compression of air to be used in a combustion turbine is old in the art. This conclusion, even if correct, does nothing to defeat the

patentability of Applicants' dependent claims in view of the fact that the independent claims from which they depend have not been shown or suggested. Claims to this feature in combination with Applicants' other non-disclosed features are proper and it is respectfully submitted that these references are in no way a basis for the rejection of these dependent claims. Since these dependent claims include the other steps of Applicants' claimed invention which, as discussed above have not been shown, then the combination of these dependent claims with the independent claims which have not been shown has also not been shown. Accordingly it is respectfully requested that all rejections of these claims under 35 U.S.C. 103(a) be withdrawn.

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Attached is a Terminal Disclaimer in compliance with 37 C.F.R. 1.31(c).

The Examiner's conclusions with respect to Garbo particularly and his response to Applicants' arguments is respectfully traversed and it is respectfully submitted that Garbo does not use a fuel-fired turbine with steam being produced from the exhaust of the turbine. As discussed above, Garbo seeks to avoid the use of fuel-fired turbines.

The remaining conclusions reached by the Examiner are also traversed in view of the foregoing comments.

In view of the foregoing comments and the attached Terminal Disclaimer it is submitted that none of the references cited and applied by the Examiner, either alone or in combination, have shown or suggested any of Applicants' claims under 35 U.S.C. 102(b) or 103(a). Accordingly it is submitted that Applicants' claims are in condition for allowance and such is respectfully solicited.

Respectfully submitted,

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